

## SPECIFICATION

### CAMERA SYSTEM, AERIAL RECONNAISSANCE, HIGH ACUITY, 18 x 18 INCH FORMAT, TYPE HR-244

#### 1. SCOPE

1.1 This specification covers one type of equipment, designated as the HR-244 Camera System, and covers in addition to the camera proper the HR-244 Camera System Stabilizer, Programmer, and Control System. The HR-244 Camera is a high-acuity, large-format framing camera intended for use in the B-70 and other aircraft of similar high-altitude, high-speed capability.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents form a part of this specification:

##### Specifications

###### Federal

NM-P-515	Plywood, Container Grade
QQ-A-596	Aluminum-Alloy, Permanent and Semi-Permanent Mold Castings
UU-P-271	Paper, Wrapping, Waterproofed, Kraft
PPP-T-60	Tape, Pressure Sensitive Adhesive, Waterproof for Packaging and Sealing
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner

###### Military

JAN-P-108	Packaging and Packing for Overseas Shipment, Boxes, Fiberboard (V-Board and W-Board), Exterior and Interior
JAN-F-675	Film, Reflection Reducing, for Glass Optical Elements
MIL-F-32	Film, Photographic, Aerial, Black and White
MIL-P-116	Preservation, Methods of
MIL-C-4150	Case, Carrying and Storage, Shock and Waterproof
MIL-D-70327	Drawings, Engineering and Associated Lists
MIL-W-5088	Wiring Aircraft, Installation of
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for

MIL-E-5400	Electronic Equipment: Aircraft, General Specification for
MIL-E-7729	Enamel, Gloss, for Aircraft Application
MIL-I-6181	Interference Limits, Tests and Design Requirements, Aircraft Electrical Equipment
MIL-L-6880	Lubrication of Aircraft, General Specifications for
MIL-T-7080	Electric Equipment, Piloted Aircraft Installation and Selection of, General Specification for
MIL-E-7894	Electric Power, Aircraft, Characteristics of
MIL-M-8857	Microfilm of Engineering Drawings and Related Data, Requirements for
MIL-F-9329	Filters, Light, Photographic Lens, for Aerial and Ground Cameras, General Specifications for
MIL-A-10936	Aluminum Base Alloys; sand castings

#### Standards

##### Federal

FED-STD-595 Colors

##### Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U. S. Military Property
MIL-STD-150	Photographic Lenses
MIL-STD-152	General Environmental Requirements, Testing Procedures, and Sampling for Aerial Photographic Reconnaissance Equipment
MIL-STD-155	Joint Photographic Type Designation System

#### Drawings

MS3106B-28-12PX	Connectors, Electric, Plugs, Straight
MS3106B-20-29P	Connectors, Electric, Plugs, Straight
	Outline, HR-244 Camera System

### 3. REQUIREMENTS

3.1 Camera. The HR-244 Camera shall be suitable for operation at altitudes between 80,000 and 120,000 feet and at aircraft velocities of Mach 0.9 and 3.0. Under these conditions of operation, the camera shall be capable of producing a ground resolution of 1 foot or better ( $W = 1$  foot per MIL-STD-150) at any point in the target area at a contrast ratio of 2:1 at the lens.

Further, the camera shall be capable of providing spot coverage of a large number of specific targets and to provide total continuous coverage over an area up to 60° either side of the line-of-flight.

3.1.1 Lens and Lens Aperture. The camera lens shall be of the refractive type, of 48-inch focal length, and  $f/5.6$  aperture. The lens shall be designed for use with high resolution films (SO-243, SO-213, SO-130) and low contrast targets.

3.1.2 Format. The format size shall be 18" x 18" and will be covered by two (2) strips of film, each 9-1/2" wide.

3.1.3 Image Motion Compensation. The camera shall be provided with a mechanism for obtaining image motion compensation due to the forward velocity of the aircraft. This mechanism shall be capable of accepting an IMC signal from a pre-programmed command, a drift sight, or from some other V/H sensor, and faithfully translating the signal to an IMC motion of the camera. Whereas the IMC correction is desired to be as near perfect as theoretically possible, in no case shall the final IMC motion be in error by more than  $\pm 1.0$  per cent of the input signal.

3.1.4 Shutter. The shutter shall be a two-curtain, focal-plane type with an effective shutter-speed range of 1/60 second to 1/250 second. Both curtain speed and shutter slit width shall be variable, such that the effective speed range may be obtained by varying either curtain speed or slit width or both. Slit width may be set at pre-flight with curtain speed adjusted during flight. To obtain the full advantage of the focal plane shutter, the shutter shall be placed with respect to the focal plane, such that the shutter curtain is as close as possible to the film plane, but in no case shall the distance from the focal plane to the curtain be more than 0.5 inch.

The construction of the shutter shall be such that shock and vibration created as a result of shutter operation shall be kept to an absolute minimum. Mounting of the shutter shall be by means of vibration isolators, so that no resultant shutter shock or vibrations will be transmitted directly to the camera optical system.

Simplicity and reliability shall be of paramount importance in the shutter design. The shutter shall be capable of operating 50,000 cycles without malfunction or adjustment.

3.1.5 Environment. To obtain the necessary system resolution, the HR-244 Camera will require a closely controlled environment. The camera will be operated within a sealed compartment which has heating devices, as well as a gas replenishment source, such that temperature variation in the camera compartment will not exceed  $\pm 5^{\circ}\text{F.}$ , and the pressure variation will not exceed  $\pm 4$  mmHg. Environmental control will not be part of the camera system.

3.1.6 Modes of Operation. To achieve the combined function of both a spotting and a total-area-coverage reconnaissance system, the camera will have to be capable of several modes of operation. Accordingly, the camera shall have a total of four (4) different modes of operation as described below:

3.1.6.1 One seven-position mode (one vertical position, and three oblique positions on either side of the line-of-flight) to provide continuous total coverage of an area up to 60° either side of the line-of-flight.

3.1.6.2 Two three-position modes (vertical, and first and second right-oblique positions, and vertical and first and second left-oblique positions).

3.1.6.3 One three-position mode (vertical, and first-right and first-left oblique).

3.1.7 Stereo. The camera shall be capable of providing a minimum of 55 per cent forward stereo overlap of all frames in all modes of operation except the seven-position mode. In the seven-position mode, a minimum of 55 per cent stereo overlap is required of all frames except the third or highest right-oblique and the third or highest left-oblique.

3.1.8 Film Capacity. The camera shall have a film load capacity of two 6,000-foot rolls of 9-1/2 inch wide, thin-base (0.0032" thick) film.

3.2 Components. The HR-244 Camera System shall consist of the following components:

	<u>Quantity</u>	
(a)	one	Main camera structure
(b)	one	Forty-eight (48") inch focal length, f/5.6, lens
(c)	one	Focal plane shutter sufficient to cover an 18" x 18" format
(d)	one	Film drive and film transport system
(e)	one	Programmer
(f)	one	Stabilizer and captivator
(g)	two	Film spools and support shafts
(h)	one	IMC Mechanism
(i)	one	Oblique-drive mechanism
(j)	one	Scanning mirror capable of viewing up to 60° transverse to the line-of-flight
(k)	one	Cockpit Camera control box

3.3 Leading Particulars, Camera. The leading particulars of the camera system, designated Type HR-244, shall be as follows:

Type	Framing
Focal length	48 Inches
Film load (thin-base)	6,000 feet (224 lbs.)
Ground coverage capability (minimum)	85,500 N. M. <sup>2</sup>

Shutter: focal plane	1/60 to 1/250 second
Total weight (including film)	620 pounds
Total volume	35 cubic feet
Lens Data:	
Type	Refracting
Focal length	48 Inches
Aperture	f/5.6
Resolution	100 lines per millimeter on SO-130 low contrast
Field half-angle	10° 37'
Filter	Yellow
Film Data:	
Type	SO-130, thin-base
Exposure Index	ASA-25
Resolution	110 at 2:1 contrast
Design Goal Limiting Resolutions:	
Ground	W = 1 foot
System	100 lines per millimeter
Angular	$8.25 \times 10^{-6}$ radians